Unit-1

Pharmacognosy-I

B.Pharma 4 Semester Notes

UNIT-II

Introduction to Pharmacognosy:

- Definition, history, scope and development of Pharmacognosy
- Sources of Drugs - Plants, Animals, Marine & Tissue culture
- Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Classification of drugs:

- Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

Quality control of Drugs of Natural Origin:

- Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.
- Quantitative microscopy of crude drugs including lycopodium spore method, leafconstants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

Introduction to Pharmacognosy:

- Pharmacognosy is defined as the scientific and systematic study of structural, physical, chemical and biological characters of crude drugs along with their history, method of cultivation, collection and preparation for the market.
- The word Pharmacognosy is derived from Greek word viz.

Pharmakon: A Drug

Gignosco : To acquire the knowledge

- The Pharmacognosy is the subject of crude drugs obtained from the plant, Animals and Minerals origins.

History of Pharmacognosy

- Egyptians wear aware of medicinal uses of several plants and animals and also about human anatomy.
- The **Greek physician Hippocrates** (460- 360 B.C) known as ***'Father of medicine'*** Aristotle the renowned philosopher (384 - 322 B.C.) is well known for his studies on animal Kingdom and Theophrastus (370 - 287 B.C.) for the plants Kingdom.
- **Pedanius Dioscorides**, (040- 080 A.D.) A Greek physician in 78 A.D. described several plants of medicinal importance in "De Materia Medica". Pliny the Elder (23-70 A.D.) who compiled 37 volumes of natural history.
- Greek pharmacist Galen (131 - 200 A.D.) described various methods of preparation containing active constituents of crude drugs. The branch of dealing with the extraction of plant and animal drugs is known as Galenical Pharmacy.
- Indian history of medicinal plants is dated back to 3500 B.C. The curative properties of plants have been mentioned in the Suktas Of Rigveda and Atharvaveda.
- Ayurveda has also described good number of plants with their therapeutic properties.
- The ancient well known known treaties in Ayurveda the Charak Samhita and Susruta Samhita are written by Charka And Susruta Respectively.

Scope of Pharmacognosy

- The crude drugs are obtained from plants and only a small number comes from animals and mineral origins.
- Pharmacognosy has wide and broad scope in the field of Pharmacy and its

Branches of them are given following:-

1) Cultivation and domestication of the medicinal plants.
2) Analysis and Phytochemical
3) Preparation of general tonic and stimulation.
4) The steroid industry
5) Herbal Preparation herbal medicine
6) Flavoring agent and perfumes.
7) Tissue Culture

8) Phytomedicine
9) Natural Products.

1. Analysis and Phytochemical:- Many Bioactive biomolecular are extracted and isolated from the crude drugs. They are analysed by modern technique such as Thin Layer Chromatography (TLC), High performance Liquid Chromatography (HPL), Gas Chromatography.

2. Herbal Preparation herbal medicine:- Herbal medicine have become more popular in recent years because it is believe that these do not have and toxin or side-effects as compare to the modern medicine.

3. Flavoring agent and perfumes:- Large number of aromatic plants which are extensively used as Flavoring agent, perfume, spicy and medicine Ajowan, Lemon grass, etc.

4. Tissue Culture:- Plant tissue Culture broadly referral to the in-vitro cultivation of plant seed and various parts of the plants organ embryo, tissue, single cell protoplast.

5. Phytomedicine :- Herbal based traditional medicine practice that uses various plant material in modalities considered both prevention and therapeutics.

Source of crude drugs:-

1) **Plant Source:-** Neem, Babul, Tulsi, Saffron, Clove.
2) **Animal source:-** Honey bee, bee wax, Silk, Insulin, Shark, Liver oil, Thyroid.
3) **Mineral source:-** Chalk, bentonite, asbestos, talc, kaolin, Fuller's earth.
4) **Micro- Organism: -** Antibiotics,
5) **Marine :-** Salt, Protozoa, etc.

Plant Source:

- Plant source is the oldest and longest source of drug. They has been used in the treatment of various discases from ancient time.
- The traditional system of medicine like Ayurveda, Siddha, Homeopathic and Unani systems are based on the use of Plants.
- Many of the plant products are having important therapeutic agents like alkaloids therapeutic agents like alkaloids, glycosides agents, volatile oil, etc.

Example:

S.No	Plants	Name	Chemical Constituents
1.	Leaves	Digitalis	Digitoxin, Digoxin
		Eucalyptus	Eucalyptus oil
		Tobacco	Nicotine
2.	Fruit	Opium	Morphine, Codeine, Heroine, Amorphine

3.	Flower	Vinca	Vincristine, Vinblastine
4.	Bark	Cinchona	Quinine (Anti-malaria), Quinidine

Animal Source:

- Many parts of a animal are a good source of drug and also some tissue/cells of humans/ animals are used in manufacturing of drug.

S.No.	Drug name	Scientific Name (Source)	Uses
1.	Honey	*Apis mellifera* (Honey bees), Apidac	Sweetening Agent, Nutrient
2.	Cod liver oil	Extracted from the livers of *Gadus morrhua*, Gadidae	Source of vitamins,Used in treatment of rickets & TB
3.	Shark liver oil	Extracted from the livers of *Hypoprion brevirostris*	Used in Vit. A deficiency, used in sunburn ointments
4.	Gelatin	Skin, ligaments, tendons and bones of animals	Hard and soft gelatin capsules
5.	Lanolin	Fat from the wool of Ovis aries(Sheep),Bovidae	Absorbable Ointment base

Mineral Source:

- Drugs from mineral source include both metallic and non-metallic substances like kaolin, chalk, diatomite kieselgurh, bentonite talc, borax etc
- Minerals or their salts are useful pharmacotherapeutic agents against different ailments

E.g: Ferrous sulfate in iron deficiency anemia, Magnesium sulfate as purgative, etc.

Microgrganisms Source:

- Microorganisms are a prolific source of structurally diverse bioactive metabolites and have yielded some of the most important products of the pharmaceutical industry.
- Microbial secondary metabolites are now being used for applications other than antibacterial, antifungal and antiviral infections.

Marine Source:

Coral, sponges, fish, and marine microorganisms produce biologically potent chemicals with interesting antiinflammatory, anti-viral, and anticancer activity.

- E.gs: Curacin A from marine cyanobacterium (Lyngbya majuscule)
- Eleutherobin from coral (Eleutherobia sp)
- Discodermolide from marine sponge (Discodermia dissolute)
- Bryostatins from marine animal (Bugula neritina)
- Dolostatins from marine gastropod mollusk (Dolabella auricularia)

Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Organized drugs:

- They are the source from plants and animals like leaves, flowers, root, etc.
- Solid in nature and studied and identified by structural features.

Examples- Leaf- Digitalis, Root Ruwolfia, Stem- Ephedra, FruitFennel, Flower- Clove

Unorganized drugs:

- These are derived from parts of plant or animal by some process of extraction and followed by purification, if necessary. Examples- Extracts, juices, lattices, gums, mucilage, resin etc.
- Solid/ Semi solid/ liquid in nature and can be studied or identified by Chemical and physical parameters

EXAMPLES OF UNORGANIZED DRUGS

Dried latex:

- Latex is the milky sap of many plants that coagulates on exposure to air. It is an emulsion or suspension in which the aqueous phase is composed of mineral salts, proteins, sugars, tannins & alkaloids. The oily phase is composed of oils, resins, etc.

Eg: Opium

Dried juices:

- These juices are got from fresh leaves, stem of tree and fruit.

Eg: Alovera juice, Amala juice, etc.

Dried extracts:

- This group includes drugs which are prepared by evaporating the aqueous decoction from parts of certain plants or animals.

Eg: Agar, Gelatine

Gums and mucilages:

- Gums and mucilage have similar constitutions and on hydrolysis yield a mixture of sugars and uronic acids.

- Gums are considered to be pathological products, while mucilage is formed by · normal metabolism.

Oleoresins:

- These are found in abundance in the trunk of the trees in the resin ducts or in rhizomes (ginger), fruits (capsicum) and other parts of the plants.
- They are insoluble in water, may be semisolid or solid.
- Many times they get associated with gums or volatile oils. Example - Copaiba, ginger

Oleo- gum -resins:

- Oleogum resins are naturally occurring mixtures of resin, volatile oil and gum.
- The example includes gum myrrh, asafoetida, gamboge, etc.
- Oleogum resin ooze out from incisions made in a bark and harden.

Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

Introduction :

Drugs are chemical constituents which are obtained by the natural/herbal sources or synthetic source. Technically and legally the term drug as defined in India under Drugs and Cosmetics Act of 1940 reads as follows.

1. All medicines for internal or external use of human beings or animal and all substances intended to be used for or in diagnosis, treatment, mitigation or prevention of disease in human beings or animals.
2. Such substances, other than food, intended to affect the structure or any function of the human body or intended to be used for the destruction or vermin or insects, which cause disease in human beings or animals as may be specified from time to time by the Central government by notification in Official Gazette

- Classification is required for each drug because they are not similar in many expect like chemical, mode of action, morphological etc. If we are not classified them then we face many problem that is drug identification, drug adverse effect, and drug action.
- For the identification and separation of drug with each other classification is required in many ways.

Classification of drugs:

- Alphabetical classification of drugs,
- Morphological classification of drugs,
- Taxonomical classification of drugs,
- Chemical classification of drugs,
- Pharmacological classification of drugs,
- Chemo classification of drugs
- Sero taxonomical classification of drugs

Alphabetical classification—

- Alphabetical classification is the simplest way of classification of any disconnected or alphabetically similar crude drug. That means drug which are belong to similar alphabet then it place the similar group.
- Crude drugs are arranged in alphabetical order of their Latin and English names (common names) or sometimes local language names (vernacular names).

Some of the pharmacopoeias, dictionaries and reference books which classify crude drugs according to this system are as follows.

- Indian Pharmacopoeia (English)

- British Pharmacopoeia (English)
- British Herbal Pharmacopoeia (English)
- United States Pharmacopoeia (English)
- British Pharmaceutical Codex. (English)
- European Pharmacopoeia (Latin)
- Pharmacopoeia Internationalis (Latin)

Taxonomical classification—

- All the plants possess different characters of morphological, microscopical, chemical, embryological, serological and genetics. In this classification the crude drugs are classified according to kingdom, subkingdom, division, class, order, family, genus and species as follows.

Merits:

- Taxonomical classification is helpful for studying evolutionary developments.

Demerits:

- This system also does not correlate in between the chemical constituents and biological activity of the drugs.

Morphological classification.

- In this, the drugs are arranged according to the morphological or external characters of the plant parts or animal parts, i.e. which part of the plant is used as a drug, e.g. leaves, roots, stem or any unorganized drug.

Organized drugs

- **Woods:** Quassia, Sandalwood.
- **Leaves:** Digitalis, Eucalyptus.
- **Barks:** Arjuna, Ashoka, Wild cherry.
- **Flowering parts:** Clove, Pyrethrum, Saffron.
- **Fruits:** Amla,, Bael,, Capsicum, Caraway.
- **Seeds:** Black Mustard, Cardamom, Ispaghula.
- **Roots and Rhizomes:** Aconite, Ashwagandha, Ginger.
- **Plants and Herbs:** Bacopa, Andrographis.
- **Hair and Fibres:** Cotton, Hemp, Jute, Silk, Flax.

Unorganized drugs

- **Dried Latex:** Opium, Papain. Dried Juice: Aloe, Kino
- **Dried extracts:** Agar, Alginate, Black catechu, Pale catechu.
- **Waxes:** Beeswax, Spermaceti. Gums: Acacia, Guar Gum, Indian Gum.

- **Resins:** Asafoetida, Benzoin, Colophony.
- **Volatile oil:** Peppermint, Sandalwood,, Lemon.
- **Fixed oils and Fats:** Arachis, Castor, Coconut, Linseed

Pharmacological classification.

- In this classification drugs are placed together, which show the similar pharmacological function or therapeutic effects.
- Drug action is a specific function for each drug due to its chief chemical constituents. Chemicals are bind to the specific receptors of our body and play a great role in the therapeutics. Some crude drug are classified below.

S.No	Pharmacological Action	Example
1.	Drug action on Nervous system	Opium, cannabis, nux-vomica, Belladona, ephedra
2.	Carminatives	Coriander, caraway, cinnamon, clove
3.	Laxatives	Castor oil, Ispaghula, senna.
4.	Antitumor	Vinca
5.	Diuretics	Gokhru, Punarnava

Chemical classification:

- In this classification crude drug are put together, which are contains the similar chemical constituents.
- It is very important expect in the classification system because chemicals are responsible for the pharmacological action.
- It is very important for the phytochemical study of crude drugs. Chemical classification is given below.

S.No.	Type of Chemicals	Examples
1.	Alkaloids	Cinchona, nux-vomica, belladonna, ipecac, vinca, opium, tea, aconite.
2.	Glycosides	Digitalis, liquorice, senna, squill, aloe, dirscorea.
3.	Volatile oils	Peppermint , clove, eucalyptus.
4.	Tannins	Kino, catechu.

Chemo-taxonomical classification.

- In this classification combine the two classifications for defining the crude drugs. In which we investigate the drug category and chemical composition. Many crude drugs which contain the chemical constituents which are belong to the similar classes or closely related to similar species or family or division.

- In this system, equal importance is given for taxonomical status and chemical constituents. There are certain types of chemical which are characteristics the specific classes of plants.
- The character most often studied in chemotaxonomy are secondary metabolites of pharmaceutical significance such as alkaloids, glycosides, flavonoids etc

Serotaxonomical classification.

- This technique is based on the highly specific relationship between antigens and the antibodies produced in response to the animal during the any infection or harm.
- The classification of very similar plants by means of difference in the proteins they contains.

Advantages:

- It is simple method, in this system location, tracing and addition of the drug is easy
- No technical person is required for handling the system.

Disadvantages:

- Scientific nature of the drug cannot be identified by this method, whether they are organised or unorganised drug.
- This system does not help in distinguishing the drugs of plant, animal and mineral source.

Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leafconstants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

Quality control of Drugs of Natural Origin:

Adulteration

- Adulterations are defined as admixture of genuine articles with spurious or harmful substances.
- The action of making something poorer in quality by the addition of another substance is also known as adulteration.

Example:-

- Mixture of Papaya seed with black pepper.
- Mixture of power of brick into red chili powder.

Methods of adulterating the drugs.

- The extent of adulteration depends upon whether the drug is obtained from other countries.
- An adulteration of a drug may be accidental.
- Adulteration is very common with drugs which are sold illegally.

Following are the various methods used for drugs adulteration.

A. Substitution with manufactured materials
B. Substitution with Inferior material
C. Substitution with Exhausted material.
D. Substitution with cheap natural substance.
E. Adulteration with non- plant material.
F. Excessive adventitious matter.

A. Substitution with manufactured materials:-

This is done with artificially manufactured material which resembles various drugs in form and appearance.

Example: - Paraffin wax has been colored yellow to substitute bee wax.

B. Substitution with Inferior material:-

- Drug are sometimes adulterated and substituted with standard commercial material. The common example of substitution is adulteration of cloves by mother cloves.

- Saffron is adulterated with dried flowers of Carthamus tinctorius (Safflower).

C. Substitution with Exhausted material.

- Exhausted material the vegetable residues which remain after the original material has been use for drug preparation.

Example

- The substitution of Alexandrian Senna with Arabian Senna.
- Used of exhausted Clove and ginger for adulteration.

D. Substitution with cheap natural substance.

- Sometimes drugs are adulterated with cheaper natural substance which has no relation to the genuine article.
- **Example: -** Japan wax for bees wax and sterculia gum for Tragacanth.

E. Adulteration with non- plant material.

- Plant materials are sometime adulteration with worthless non-plant materials.

Evaluation of crude drugs:-

- Evaluation of drugs means identify of its quality and purity. It is also includes the detection of the nature of adulteration in the crude drugs.
- The morphological character may suffice the need of detection but in case of powdered drugs the microscopic characters, while in case of liquid drug chemical tests and one of the physical standards such as specific gravity, optical rotation solubility etc.
- May be helpful in detection of adulteration. The methods are employed in detecting adulteration is genuine drugs.
- The crude drugs can be identified on the basic of their morphological, histological and chemical studies.

The different techniques involved in standardization of crude drugs are as follow.

1. Physical Evaluation:-

- Physical standards are to be determined for drugs wherever possible.
- They may help in evaluation, specifically with reference to specific gravity, density, optical rotation refractive index, melting point, viscosity and solubility in different solvents.

2. Chemical Evaluation:-

- Chemical comprises of different chemical tests and chemical assays.

- The isolation, purification and identification of active constituents are chemical methods of evaluation Quantitative chemical tests such as Acid value, Saponification value etc.
- It also help in proper identification of various of the crude drugs.

3. Biological Evaluation:-

- The estimation of potency of crude drugs is done by means of the its effect on the living organism like bacterial, fungal growth or animal tissue or entities animal, it is called as bioassay.
- Bioassay is the measure of sample being tested capable of producing the biological effects as that of the standard preparation.

4. Morphological Evaluation (Organoleptic):-

- It is refers to evaluation of drugs by colour, odor, teste, size, shape and special features like touch, texture and sound etc.
- The study of form of crude drugs is morphology while description of the form is morphography.
- The adulteration of seeds of strychnos nux-vomica with the seed of strychnos nux-blanda or Strychnos potatorum, caraway with Indian dill, Alexandrian Senna with dog Senna is identified by morphological techniques.

5. Microscopic Evaluation:-

- The microscopic evaluation also covers study of constituents by application of chemical tests to small quantities of drugs in powdered form or to histological sections of the drug (micro-chemistry)
- This method allows more detailed examination of a drug and its can be used to identify organised drugs by their know histological characters.
- Histological studies are made from very thin sections of the drugs.
- Microscope by virtue of its property to magnify permits the minute structure under study to be enlarged and can be used to confirm the structural details of the drugs from plants origin.

Quantitative microscopy of crude drugs including:

Lycopodium spore method:

- This method is use to identify the crude drugs when the chemical and physical methods are inapplicable.
- This method is also useful to detect the adulteration present in the crude drugs containing starch grains.

Examples:

- The percentage purity of an authentic powdered ginger is calculated using the following equation:

% purity= N x W x 94000 x 100 / S x M x P

Where,

- N = Number of characteristic structures (starch grain) in 25 fields.
- W = Weight in mg oflycopodium taken.
- S = Number oflycopodium spores in the same 25 fields.
- M = Weight in mgof the sample, calculated on the basis of sample dried at 105°C.
- P = 2,86,000 in case of ginger starch grains powder.

Significance:

- Determination of foreign organic matter.
- Determination of percentage purity of drugs.
- Detection of adulterant

Leafconstants:

1. Stomal Index:

- It is the percentage proportion of the number of stomata to the total number of epidermal cells.
- Stomatal number varies considerably with the age of the leaf but stomatal index is relatively constant for a given species.

Example: Atropa- 20.0-23.0 Oower epidermis)

2. Stomata number:

- Stomatal number is defined as the average number of stomata per sq mm of epidermis of the leaf.

3. Palisade ratio:

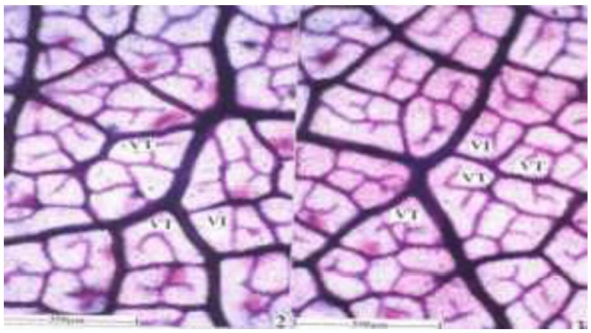
- Numbers of palisade cell under each epidermal cell

4. Vein islet number:

- Number of vein islet per sq. mm of the leaf surface between midrib and margin

5. Vein-termination:

- Number of veinlet termination per sq. mm of the leaf between midrib and margin.



Camera Lucida:

Object:

- It is an optical device or instrument in which rays of light are reflected by a prism to produce an image on a sheet of paper, from which a drawing is made.
- It works on simple optical principle reflecting beam of light through a prism and a plane mirror.
- There are two types of camera lucida namely Swift Ives and Abbe model camera lucida.
- The Abbe camera lucida consists of a prism fitted over the eyepiece of the microscope.
- A side arm is carrying a mirror that supported vertical over the tracing paper
- In Swift Ives Camera lucida the plane mirror is replaced by a small right angled prism.
- It is a small size and fitted over the eyepiece of the microscope with a screw.